An Equation for the "Sum of Squares equal a Square" by R. J. ADCOCK, Larchland, Illinois.

The following identical equation for the sum of squares=a square, I have not seen published. If $u=x+y+z+v+w$, $u^2=x^2+y^2+z^2+v^2+w^2+2xy+2xz+2xv+2xw+2yz+2yv+2yw+2zv+2zw+2vw$; and if the sum of products two in a set=0, $u^2=x^2+y^2+z^2+v^2+w^2$, $w=-\dfrac{xy+xz+xv+yz+yv+zv}{x+y+z+v}$,

$$u^2=x^2+y^2+z^2+v^2+\left(\frac{xy+xz+xv+yz+yv+zv}{x+y+z+v}\right)^2=$$

$$\left[x+y+z+v-\left(\frac{xy+xz+xv+yz+yv+zv}{x+y+z+v}\right)\right]^2.$$

Clearing of fractions and reducing, $[x(x+y+z+v)]^2+y^2(x+y+z+v)^2+z^2(x+y+z+v)^2+v^2(x+y+z+v)^2+(xy+xz+xv+yz+yv+zv)^2=(x^2+y^2+z^2+v^2+xy+xz+xv+yz+yv+zv)^2$. True for three or any greater number of letters.

COMMENT.—In the solution of problem 21, page 163, Vol. II, May No., Dr. Martin uses an ingenuous method for finding a general formula "to find nine integral square numbers whose sum is a square number."

The same formula, expressed for finding n integral square numbers whose sum is a square number, may be produced, more directly, from $(2pq)^2+(p^2-q^2)^2=(p^2+q^2)^2$. Put $p^2=m_1^2+m_2^2+m_3^2+\ldots\ldots+m^2{}_{n-1}$ and $q^2=m^2{}_n$, in which $m_1 m_2, m_3, \ldots\ldots m_n$ represent any n integers.

We readily obtain $(2m_1m_n)^2+(2m_2m_n)^2+(2m_3m_n)^2+\ldots\ldots+(2m_{n-1}m_n)^2+(m_1^2+m_2^2+m_3^2+\ldots\ldots+m^2{}_{n-1}-m^2{}_n)^2=(m_1^2+m_2^2+m_3^2+\ldots\ldots+m^2{}_n)^2$.

Illustration. Let $n=9$, and put $m_1=1$, $m_2=2$, $m_3=3$, $m_4=4$, $m_5=5$, $m_6=6$, $m_7=7$, $m_8=8$, and $m_9=9$. Substituting these values in the formula and dividing by 12, we obtain $1^2+2^2+3^2+4^2+5^2+6^2+7^2+8^2+14^2=20^2$.

PROBMEMS.

37. Proposed by A. H. BELL, Hillsboro, Illinois.

Find the first four, integral values of n in $\dfrac{n(5n-3)}{2}=\square$.

This is the general form of septagonal numbers, 1, 7, 18, 34, 55, etc.

38. Proposed by H. C. WILKES, Skull Run West Virginia.

Let n be any number and let $n^3+1=x$. Then $x^3+(2x-3)^3+(nx-3n)^3=n^3x^3$. How can this be demonstrated; it will always be found true on trial.

39. Proposed by F. P. MATZ, M. Sc., Ph. D, Professor of Mathematics and Astronomy in Irving College, Mechanicsburg, Pennsylvania.

The mth root of the nth power of an *integral* number is a perfect pth power. What is the number?